

**Instructions:** Complete each of the following exercises for practice.

1. Consider the functions  $f(x, y) = \cos(x + 2y)$  and  $g(x, y, z) = \sqrt{x} + \sqrt{y} + \sqrt{z} + \ln(4 - x^2 - y^2 - z^2)$ .

(a) Evaluate  $f(2, -1)$  and  $g(1, 1, 1)$ .

(b) Compute the domain and range of  $f$ .

(c) Compute the domain and range of  $g$ .

2. Sketch graphs of the following functions.

(a)  $f(x, y) = \cos(x)$

(b)  $g(x, y) = y$

(c)  $h(x, y) = 2 - x^2 - y^2$

3. Complete Problem 14.1.32 in the textbook (matching functions to their graphs).

4. Complete Problem 14.1.38 in the textbook (make a contour map of a given function).

5. Draw a contour map of the functions below, showing several level curves.

(a)  $f(x, y) = x^2 - y^2$

(b)  $f(x, y) = xy$

(c)  $f(x, y) = \frac{y}{x^2 + y^2}$

6. Complete Problems 14.1.61 through 14.1.68 in the textbook (match a function with its graph and contour map).

7. Use a computer to graph  $f(x, y) = x^2 + cxy + y^2$  for various  $c \in \mathbb{R}$ ; how does the shape change with changing  $c$ ?

8. Let  $g(t)$  be a single variable function and  $f(x, y) = g(\sqrt{x^2 + y^2})$ . Describe the graph of  $f$ .